14/7/26 (Item 2 from file: 73) Links
Fulltext available through: ScienceDirect (Elsevier) USPTO Full Text Retrieval Options SCIENCEDIRECT
EMBASE

06825732 **EMBASE No:** 1997108230

Preliminary experience with medical applications of rapid prototyping by selective laser sintering

Berry E.; Brown J.M.; Connell M.; Craven C.M.; Efford N.D.; Radjenovic A.; Smith M.A.
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Medical Engineering and Physics (MED. ENG. PHYS.) (United Kingdom) 1997 , 19/1 (90-96)
CODEN: MEPHE **ISSN:** 1350-4533
Publisher Item Identifier: S1350453396000392
Document Type: Journal ; Article
Language: ENGLISH **Summary Language:** ENGLISH
Number Of References: 35

Rapid prototyping techniques, originally developed for building components from computer aided designs in the motor industry, are now being applied in medicine to build **models** of human anatomy from high resolution multiplanar **imaging** data such as computed **tomography** (**CT**). The established technique of stereolithography and the more recent selective laser sintering (SLS), both build up an object by layer. **Models** have applications in surgical planning, for the design of customised implants and for training. Preliminary experience of using the SLS technique for medical applications is described, addressing questions regarding image processing, data transfer and manufacture. Pilot **models**, build from nylon, included two skulls (a child with **craniosynostosis** and an adult with hypertelorism) and a normal femur which was modelled for use in a bioengineering test of an artificial hip. The dimensions of the **models** were found to be in good agreement with the **CT** data from which they were built - for the child's skull the difference between the **model** and the **CT** data was less than 1.0 +/- 0.5 mm in each direction. Our experience showed that, with care, a combination of existing software packages may be used for data conversion. Ideally, image data of high spatial resolution should be used. The pilot **models** generated sufficient clinical interest for the technique to be pursued in the orthopaedic field.

14/7/30 (Item 2 from file: 94) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
JICST-EPlus

03384285 **JICST Accession Number:** 97A0531504 **File Segment:** JICST-E
Skull Base Surgery. Skull Base Surgery. Ideas and Innovations for Craniofacial Surgery.
ONISHI KIYOSHI (1); MARUYAMA YU (1); SAWAIZUMI MASAYUKI (1); SEIKI YOSHIKATSU (1); SHIBATA IEKADO (1)
(1) Toho Univ.
Shoni no Noshinkei (Nervous System in Children) , 1996 , VOL.21,NO.2 , PAGE.85-92 , FIG.7, REF.26
Journal Number: G0347BAT **ISSN:** 0387-8023
Universal Decimal Classification: 616.83-089
Language: Japanese **Country of Publication:** Japan
Document Type: Journal
Article Type: Original paper
Media Type: Printed Publication
Abstract: Craniosynostosis treatment is aimed at prevention of such functional disorders as high intracranial pressure and psychomotor development disorders by resolving cerebral growth impairment and, at the same time, improving morphological abnormalities. Recent developments in craniofacial surgery have made it possible to perform a series of surgical procedures such as osteotomies including the skull base, and the remodelling of multiple bone flaps. This has contributed to considerable improvement in therapeutic results. In addition, we have developed the following ideas and innovations for the performing of these surgical procedures. (1) Rigid/semi-rigid osteosynthesis with titanium plates: Fixing bone flaps three-dimensionally with titanium microplate and TM HAKEN plate to retraction (Figs. 1,2). (2) Intra-operative scalp expansion with a tissue expander: Expanding scalp intra-operatively with tissue expander when closing wounds and maintaining shape of remodelled bone flaps (Fig. 3). (3) **Simulation** surgery using a three-dimensional substantial **model**: Creating a three-dimensional substantial **model** based on **CT** data to perform accurate **simulation** surgery conforming with actual operation (Fig. 4). (4) Bone transfer using outer table of calvarial bone graft and flap: Ensuring reliable bone transfer with bone grafts using the outer table of calvarial bone and vascularized outer table calvarial bone flaps (Figs. 5,6). (5) Osteosynthesis with bio-absorbable implants: using absorbable PLLA plates, which have excellent biocompatibility, to avoid bone growth inhibition in children (Fig. 7). These ideas and innovations have been applied in surgery for various traumatic bone factures, growing skull fractures, **craniosynostosis** including oxycepahly, Apert's syndrome, and so forth. Both functional and esthetic results were satisfactory. (author abst.)

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Set     Items   Description
S1    6016901   S IMAGING OR ACOUSTIC OR ULTRASOUND OR ULTRASONOGR? OR SONOL? OR SONOGR?
OR TOMOGRAPH? OR THERMOGRA? OR ULTRASOUND OR TOMOGRA? OR (MAGNETIC()RESONANCE) OR
(RADIONUCLIDE()SCANNING) OR ULTRASONOGRA? OR CT OR MRI OR (RAPID()PROTOTYPING)
S2       9747   S CRANIOSYNOSTO? OR CRANIOSTOS?
S3     179132   S SUTURE? ? OR (FIBROUS()JOINT? ?) OR SYNOSTOSIS
S4     223600   S CRANIAL? OR CRANIUM? OR SKULL (BRAIN()CASE) OR FONTANELL?
S5       4837   S S3(10N)S4
S6       1531   S S1(S)(S2 OR S5)
S7      37878   S DOLL? ? OR BABYDOLL? OR DOLLBAB??? OR FIGURINE? ? OR MANNEQUIN? ? OR
DUMMY OR MANIKIN?
S8          4   S S7 AND S6
S9          1   RD  (unique items)
S10  19607538   S LIKENESS?? OR EFFIG? OR MODEL? ? OR REPRESENTA? OR MOCKUP? ? OR
MOCK()UP? ? OR REPLICA? OR DUMMY OR DUMMIES OR PROTOTYPE? ? OR RESEMBL??? OR SIMULAT??? OR
IMITAT??? OR COPY??? OR COPIE? ? OR MIMIC???? OR FACSIMILE
S11       210   S S6 AND S10
S12        84   S S11/2003:2007
S13       126   S S11 NOT S12
S14        59   RD  (unique items)
S15   4543367   S TOOL OR TRAIN??? OR PRETRAIN??? OR POSTTRAIN??? OR SCREEN???
S16       104   S S6 AND S15
S17        37   S S16/2003:2007
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**File 94: UD200609W2 is the last update for 2006. UD200701W1 is the first update for 2007. The file is complete and up to date.*

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9/7/1 (Item 1 from file: 155) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

14942282 **PMID:** 15105977

Cranial suture simulator for ultrasound diagnosis of craniosynostosis.

Ngo Anh-Vu; Sze Raymond W; Parisi Marguerite T; Sidhu Manrita; Paladin Angelisa M; Weinberger Ed; Seidel Kristy D; Cunningham Michael L
University of Washington, 134 Mary Gates Hall, Seattle, WA 98195-2810, USA. anh-vu.ngo@seattlechildrens.org
Pediatric radiology (Germany) Jul 2004 , 34 (7) p535-40 , **ISSN:** 0301-0449--Print **Journal Code:** 0365332
Publishing Model Print-Electronic
Document type: Evaluation Studies; Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
BACKGROUND: In evaluating the effectiveness of ultrasound as a screening tool for craniosynostosis it was discovered that sonologists and sonographers needed more experience scanning and visualizing cranial sutures on ultrasound. OBJECTIVE: To create an ultrasound simulator to train radiologists and technologists to locate and recognize patent and fused cranial sutures in children. MATERIALS AND METHODS: The hypoechoic appearance of patent sutures was simulated by cutting lines into life-sized plastic doll heads and filling them with a commercial hypoechogenic material. Fused hyperechoic sutures were simulated by not cutting into the hard plastic region of a suture. The simulator's teaching value was evaluated on three radiology residents and three fellows. Subjects performed pre-training scans on unknown simulators, received feedback and an opportunity to scan a training simulator, and then performed post-training scans on random unknown simulators. Accuracy was recorded as percentage of correctly demonstrated sutures. RESULTS: The suture simulator reproduces the sonographic appearance of patent and fused cranial sutures. Accuracy of acquisition, interpretation, and overall diagnosis increased from 64 to 91%, 79 to 91%, 61 to 97%, respectively, between pre and post training scans. CONCLUSION: An ultrasound simulator can reproduce the appearance of patent and fused cranial **sutures** in children and can be used to train radiologists and technologists in the performance of a screening protocol.
Record Date Created: 20040618
Record Date Completed: 20050310
Date of Electronic Publication: 20040423

14/7/1 (Item 1 from file: 155) **Links**
Fulltext available through: SpringerLink USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

14055758 **PMID:** 12483355

True 3D reconstruction for planning of surgery on malformed skulls.

Levi D; Rampa F; Barbieri C; Pricca P; Franzini A; Pezzotta S
Irccs Policlinico San Matteo, Piazzale Golgi, 2, 27100 Pavia, Italy.
Child's nervous system - ChNS - official journal of the International Society for Pediatric Neurosurgery (Germany)
Dec 2002 , 18 (12) p705-6 , **ISSN:** 0256-7040--Print **Journal Code:** 8503227
Publishing Model Print-Electronic
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
OBJECTIVES: Since the difficulty associated with surgical planning of **craniosynostosis** is mostly due to the inadequate possibilities for **simulation** of surgery, a new technique for constructing a precise reproduction of a patient's malformed skull has been developed. MATERIALS AND METHODS: **CT** scans of ten malformed skulls on a scale of 1:1 and with 1-mm slices have been used to reconstruct the skulls in a special resin using a special lathe used in the automobile construction industry for formula one engines. This lathe works in the opposite way to other lathes: by apposition of material instead of subtraction. RESULTS: The anatomical detail of the phantom is of a very high degree. The surgical planning it allows has proved highly consistent with reality in all cases in which it has been used in the planning before the operation. DISCUSSION AND CONCLUSIONS: This technique has made it possible to plan the surgical treatment of all patients with **craniosynostosis** in a highly satisfactory way. It has reduced operating times, in addition to which it provides information on materials needed, avoiding waste, and is also an excellent teaching method for residents.
Record Date Created: 20021216
Record Date Completed: 20030408
Date of Electronic Publication: 20021026

14/7/4 (Item 4 from file: 155) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

13467181 **PMID:** 11711821

On the assets of CAD planning for craniosynostosis surgery.

Mommaerts M Y; Jans G; Vander Sloten J; Staels P F; Van der Perre G; Gobin R
Division of Maxillo-Facial Surgery, Department of Surgery and Cleft Palate & Craniofacial Anomalies Team, General Hospital St. Jan, Bruges, Belgium. maurice.mommaerts@azbrugge.be
Journal of craniofacial surgery (United States) Nov 2001 , 12 (6) p547-54 , **ISSN:** 1049-2275--Print **Journal Code:** 9010410
Publishing Model Print
Document type: Case Reports; Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
SkullWiz is a computer-aided design program that transforms computer **tomographic** data of the neurocranium into a mathematical **model** that can be interactively manipulated to plan **craniosynostosis** surgery. Proper planning of this type of surgery involves reference to the underlying viscerocranium and to normal neurocranial dimensions, **simulation** of all basic surgical actions (closed and open osteotomy, translation, rotation, bending, removal, burring), and reference to the mechanical properties of calvarial bone at a given age. With SkullWiz, infinite trials are possible to develop a surgical plan that combines minimal action with maximum morphologic result. In contrast, physical **models**, e.g., foam milled or stereolitographic, provide just a single (or double, after gluing) opportunity to visualize three-dimensional morphology and **simulate** a treatment plan, without reference support. Validation of SkullWiz is difficult due to parameter variability. Its assets are therefore graphically exemplified in two common types of nonsyndromatic single-suture **craniosynostosis**-trigonocephaly and anterior plagiocephaly. SkullWiz is one of the most accurate planning tools currently available for **craniosynostosis** surgery. Accurate transfer of the planning by aluminium templates results in efficient and precise surgery by avoiding per-operative "chipping and fitting."
Record Date Created: 20011116
Record Date Completed: 20020208

14/7/10 (Item 10 from file: 155) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

12453844 **PMID:** 10396116

Reduction of operating time and blood transfusion for craniosynostosis by simulated surgery using three-dimensional solid models.

Imai K; Tsujiguchi K; Toda C; Enoki E; Sung K C; Sakamoto H; Kitano S; Hatoko M; Tajima S
Department of Plastic and Reconstructive Surgery, Osaka City General Hospital.
Neurologia medico-chirurgica (JAPAN) Jun 1999 , 39 (6) p423-6; discussion 427 , **ISSN:** 0470-8105--Print
Journal Code: 0400775
Publishing Model Print
Document type: Clinical Trial; Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
Preoperative planning of craniofacial synostosis can be achieved through the use of two- or three-dimensional (3D) computed **tomography** (**CT**) images and by 3D solid **models**. The advantage of using 3D **models** was evaluated by calculating the amount of blood transfused and the operating time for 36 **craniosynostosis** procedures, 21 planned with 3D **models** and 15 with **CT** images performed in the past 7 years. The use of 3D **models** reduced both blood loss and operating time for fronto-orbital advancement with reshaping, LeFort III advancement, and LeFort IV minus Glabellar advancement; blood loss for fronto-orbital advancement without reshaping; and operating time for total cranial reshaping.
Record Date Created: 19990727
Record Date Completed: 19990727

14/7/14 (Item 14 from file: 155) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

11866663 **PMID:** 9693554
Intracranial volume in craniosynostotic rabbits.

Mooney M P; Burrows A M; Wigginton W; Singhal V K; Losken H W; Smith T D; Dechant J; Towbin A; Cooper G M; Towbin R; Siegel M I
Department of Anatomy, University of Pittsburgh, PA 15261, USA.
Journal of craniofacial surgery (UNITED STATES) May 1998 , 9 (3) p234-9 , **ISSN:** 1049-2275--Print
Journal Code: 9010410
Contract/Grant No.: DE10830; DE; NIDCR
Publishing Model Print
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
Although **craniosynostosis** alters brain growth direction resulting in compensatory changes in the neurocranium, it has been suggested that such compensations occur with little reduction in intracranial volume (ICV). This hypothesis was tested in a rabbit **model** with nonsyndromic, familial coronal suture synostosis. Cross-sectional three-dimensional computed **tomographic** head scans were obtained from 79 rabbits (25 normal, 28 with delayed-onset synostosis, and 26 with early-onset synostosis) at 25, 42, and 126 days of age. Intracranial contents were reconstructed and indirect ICV was calculated. Results revealed that by 25 days of age the intracranial contents from early-onset synostosed rabbit skulls showed rostral (anterior) constrictions and a "beaten copper" morphology in the parietal and temporal regions compared with the other two groups. These deformities increased in severity with age. Quantitatively, ICV was significantly reduced ($P < 0.05$) by 7% in rabbits with early-onset synostosis compared with both control rabbits and rabbits with delayed-onset synostosis at 25 days of age. By 126 days of age, ICV in rabbits with synostosis was significantly reduced ($p < 0.05$) by 11% in early-onset synostosis and by 8% in delayed-onset synostosis compared with normal rabbits. Results suggest that in rabbits with uncorrected **craniosynostosis**, compensatory changes in the neurocranium were not adequate to allow normal expansion of the neurocapsular matrix. Further research is needed to determine if ICV reduction is correlated with cerebral atrophy or cerebral spinal fluid (i.e., ventricular or subarachnoid) space compression in this **model**.
Record Date Created: 19980813
Record Date Completed: 19980813

14/7/15 (Item 15 from file: 155) **Links**
Fulltext available through: SpringerLink USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

11866008 **PMID:** 9694336

A rabbit model of human familial, nonsyndromic unicoronal suture synostosis. II. Intracranial contents, intracranial volume, and intracranial pressure.

Mooney M P; Siegel M I; Burrows A M; Smith T D; Losken H W; Dechant J; Cooper G; Fellows-Mayle W; Kapucu M R; Kapucu L O
Department of Anatomy and Histology, University of Pittsburgh, PA 15261, USA.
Child's nervous system - ChNS - official journal of the International Society for Pediatric Neurosurgery (GERMANY) Jun 1998 , 14 (6) p247-55 , **ISSN:** 0256-7040--Print **Journal Code:** 8503227
Contract/Grant No.: DE10830-01; DE; NIDCR
Publishing Model Print
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
This two-part study reviews data from a recently developed colony of New Zealand white rabbits with familial, nonsyndromic unilateral coronal suture synostosis, and this second part presents neuropathological findings and age-related changes in intracranial volume (ICV) and intracranial pressure (ICP) in 106 normal rabbits and 56 **craniosynostotic** rabbits from this colony. Brain morphology and anteroposterior length were described in 44 rabbit fetuses and perinates (27 normal; 17 synostosed). Middle meningeal artery patterns were qualitatively assessed from 2-D PCC **MRI** VENC scans and endocranial tracings from 15, 126-day-old rabbits (8 normal, 7 rabbits with unicoronal synostosis). Brain metabolism was evaluated by assessing 18F-FDG uptake with high-resolution PET scanning in 7, 25-day-old rabbits (3 normal, 4 with unicoronal or bicoronal synostosis). Intracranial contents and ICV were assessed using 3-D **CT** scanning of the skulls of 30 rabbits (20 normal,10 with unicoronal synostosis) at 42 and 126 days of age. Serial ICP data were collected from 66 rabbits (49 normal; 17 with unicoronal synostosis) at 25 and 42 days of age. ICP was assessed in the epidural space using a Codman NeuroMonitor microsensor transducer. Results revealed that cerebral cortex morphology was similar between normal and synostosed fetuses around the time of synostosis. Significantly ($P<0.05$) decreased A-P cerebral hemisphere growth rates and asymmetrical cortical remodeling were noted with increasing age in synostotic rabbits. In addition, rabbits with unicoronal suture synostosis exhibited asymmetrical middle meningeal artery patterns, decreased and asymmetrical brain metabolism, a "beaten-copper" intracranial appearance, significantly ($P<0.05$) decreased ICV, and significantly ($P<0.01$) elevated ICP compared with normal control rabbits. The advantages and disadvantages of these rabbits as a **model** for human familial, nonsyndromic unicoronal suture synostosis are discussed, especially in light of recent clinical neuropathological, ICV, and ICP findings recorded in human **craniosynostotic** studies.
Record Date Created: 19981106
Record Date Completed: 19981106

14/7/16 (Item 16 from file: 155) **Links**
Fulltext available through: custom link USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

11492125 **PMID:** 9326772

Age related changes in intracranial volume in rabbits with craniosynostosis.

Singhal V K; Mooney M P; Burrows A M; Wigginton W; Losken H W; Smith T D; Towbin R; Siegel M I
Cleft Palate-Craniofacial Center, Division of Plastic Surgery, University of Pittsburgh, USA.
Plastic and reconstructive surgery (UNITED STATES) Oct 1997 , 100 (5) p1121-8; 1129-30 , **ISSN:** 0032-1052--Print **Journal Code:** 1306050
Contract/Grant No.: DE 10830; DE; NIDCR
Publishing Model Print
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
Neurocapsular growth is highly heritable and determines neurocranial form. Although **craniosynostosis** alters brain growth direction, resulting in compensatory changes in the neurocranium, it is believed that such compensations occur without reduction in intracranial volume. This hypothesis was tested in a rabbit **model** with nonsyndromic, familial coronal suture synostosis. Skulls of 56 rabbits (20 normals, 20 with delayed onset synostosis, and 16 with complete synostosis) were scanned using three-dimensional computed **tomography** at 6 and 18 weeks of age. Intracranial contents were reconstructed, and indirect intracranial volume was calculated. Qualitatively, re-formations of intracranial contents from completely synostosed rabbit skulls exhibited the typical "copper beaten" morphology. Quantitatively, intracranial volume was significantly ($p < 0.05$) reduced in rabbit skulls with complete synostosis compared with both control rabbit skulls and rabbit skulls with delayed onset synostosis at 6 weeks by 11 percent and 14 percent, respectively). By 18 weeks, intracranial volume in rabbit skulls with synostosis was significantly ($p < 0.05$) reduced (by 12 percent in complete synostosis and 8 percent in delayed onset synostosis) compared with normal rabbits. Results suggest that in rabbits with uncorrected **craniosynostosis**, compensatory changes in the neurocranium were not adequate to allow normal expansion of the neurocapsular matrix. Further research is needed to determine whether reduction in intracranial volume was a result of neural tissue deficiency or cerebrospinal fluid (i.e., ventricular or subarachnoid) space compression in this **model**.
Record Date Created: 19971030
Record Date Completed: 19971030

14/7/18 (Item 18 from file: 155) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

11262712 **PMID:** 9057541
Sonography of normal cranial sutures.

Soboleski D; McCloskey D; Mussari B; Sauerbrei E; Clarke M; Fletcher A
Kingston General Hospital, Ontario, Canada.
AJR. American journal of roentgenology (UNITED STATES) Mar 1997 , 168 (3) p819-21 , **ISSN:** 0361-803X--Print **Journal Code:** 7708173
Publishing Model Print
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
OBJECTIVE: The purpose of this study was to describe the normal sonographic appearance and measurement of normal major **cranial sutures** in neonates and infants. SUBJECTS AND METHODS: High-resolution **sonograms** of sagittal, coronal, and lambdoid sutures were obtained for two autopsy specimens and correlated with histologic sections obtained at identical locations. Also, 50 neonates and infants (0-5 months old [corrected age]) who had normally shaped craniums underwent **sonography** of the brain that produced normal findings. These neonates and infants also underwent sutural **sonograms**. The width and thickness of each of the major **cranial sutures** (sagittal, coronal, and lambdoid) were measured, with mean values established. Measurements were analyzed with paired t tests for interobserver variability. Linear regression was used for correlation of measurements with age. RESULTS: With a scan plane perpendicular to the suture line, **sonograms** revealed sutures as hypoechoic gaps between two hyperechoic bony plates. On **sonograms**, sagittal sutures had an end-to-end appearance instead of the beveled junction seen throughout most of the coronal and lambdoid sutures. In the 50 patients, **sonograms** revealed the mean width to be 0.89 +/- 0.35 mm (mean +/- SD) for coronal sutures. 0.93 +/- 0.28 mm for sagittal sutures, and 0.96 +/- 0.39 mm for lambdoid sutures. On **sonograms**, mean thickness was 1.97 +/- 0.54 mm for coronal sutures, 1.88 +/- 0.56 mm for sagittal sutures, and 2.49 +/- 0.86 mm for lambdoid sutures. We found no interobserver variability ($p <$ or $= .05$). With linear regression analysis, we found no correlation between suture width or thickness and patient age ($r = .01$). CONCLUSION: In our study, high-resolution **sonography** proved to be a reliable and inexpensive technique capable of defining **cranial sutures**. Preliminary normative data obtained for **cranial suture** width and thickness showed no correlation with age in our population group. The normative data obtained will allow recognition of abnormal sutures, particularly synostotic or diastatic sutures.
Record Date Created: 19970404
Record Date Completed: 19970404

14/7/38 (Item 1 from file: 34) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
SciSearch(R) Cited Ref Sci

11534963 **Genuine Article#:** 608BK **Number of References:** 0
Cranial suture simulator for ultrasound diagnosis of craniosynostosis

Author: Ngo A; Sze RW; Parisi MT; Paladin AM; Cunningham ML
Journal: RADIOLOGY , 2002 , V 225 , S (NOV) , P 141-141
ISSN: 0033-8419 **Publication date:** 20021100
Publisher: RADIOLOGICAL SOC NORTH AMERICA , 820 JORIE BLVD, OAK BROOK, IL 60523 USA
Language: English **Document Type:** MEETING ABSTRACT

14/7/46 (Item 9 from file: 34) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
SciSearch(R) Cited Ref Sci

07159954 **Genuine Article#:** 130KN **Number of References:** 37
Stereolithographic (SL) biomodelling in craniofacial surgery

Author: DUrso PS (REPRINT) ; Atkinson RL; Lanigan MW; Earwaker WJ; Bruce IJ; Holmes A; Barker TM; Effeney DJ; Thompson RG
Corporate Source: UNIV QUEENSLAND,DEPT SURG/BRISBANE/QLD 4072/AUSTRALIA/ (REPRINT); UNIV QUEENSLAND,MATER CHILDRENS HOSP, CRANIOFACIAL CLIN/BRISBANE/QLD 4101/AUSTRALIA/; HOLY SPIRIT HOSP,DEPT DIAGNOST IMAGING/BRISBANE/QLD/AUSTRALIA/; ROYAL CHILDRENS HOSP,MELBOURNE CRANIOFACIAL UNIT/MELBOURNE/VIC/AUSTRALIA/; QUEENSLAND UNIV TECHNOL,SCH MECH MFG & MED ENGN/BRISBANE/QLD/AUSTRALIA/; QUEENSLAND MFG INST,/BRISBANE/QLD/AUSTRALIA/
Journal: BRITISH JOURNAL OF PLASTIC SURGERY , 1998 , V 51 , N7 (OCT) , P 522-530
ISSN: 0007-1226 **Publication date:** 19981000
Publisher: CHURCHILL LIVINGSTONE , JOURNAL PRODUCTION DEPT, ROBERT STEVENSON HOUSE, 1-3 BAXTERS PLACE, LEITH WALK, EDINBURGH EH1 3AF, MIDLOTHIAN, SCOTLAND
Language: English **Document Type:** ARTICLE
Abstract: Background: Stereolithographic (SL) biomodelling allows 3D CT to be used to generate solid plastic **replicas** of anatomical structures (biomodels). Case reports in the literature suggest that such biomodels may have a use in craniofacial surgery but no large series or assessment of utility has been reported. A prospective trial to assess the utility of biomodeiling in craniofacial surgery has been performed.

Methods: Forty patients with complex craniofacial abnormalities were selected and 3D CT scanning performed. The data of interest was used to guide a laser to selectively polymerise photosensitive resin to manufacture SL biomodels. The biomodels were used for patient education, diagnosis and operative planning. An assessment protocol was designed to test the hypothesis that biomodels in addition to standard imaging had greater utility in the surgery performed than the standard imaging alone.

Results: Anecdotally surgeons found biomodelling useful in 40 complex craniofacial operations. The formal assessment of the first 10 cases suggested biomodels improved operative planning (image 76%, image with bio-**model** 97%, $P < 0.01$) and diagnosis (image 82.5%, image with biomodel 99.25%, $P < 0.01$). Surgeons estimated that the use of biomodels had reduced operating time by a mean of 16% and were cost effective at a mean price of $1100 AUS.

Conclusion: Biomodelling was reported as an intuitive, user-friendly technology that facilitated diagnosis, operative planning and communication between colleagues and patients. Limitations of the technology were manufacturing time and cost.

20/7/10 (Item 10 from file: 155) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

10728785 **PMID:** 8583528
Volume imaging: three-dimensional appreciation of the fetal head and face.

Devonald K J; Ellwood D A; Griffiths K A; Kossoff G; Gill R W; Kadi A P; Nash D M; Warren P S; Davis W; Picker R
Department of Perinatal Ultrasound, Nepean Hospital, Penrith, New South Wales, Australia.
Journal of ultrasound in medicine - official journal of the American Institute of Ultrasound in Medicine (UNITED STATES) Dec 1995 , 14 (12) p919-25 , **ISSN:** 0278-4297--Print **Journal Code:** 8211547
Publishing Model Print
Document type: Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
Quasi-three-dimensional volume imaging provides an inexpensive means of evaluating the usefulness of three-dimensional imaging. The technique works most efficiently with water-skin interfaces and therefore we investigated its application in obstetrical ultrasonography. Three-dimensional perspectives of the normal and abnormal fetal head and face were spectacular and at times provided more information than the two-dimensional images. The ability of an inexperienced observer to interpret the three-dimensional image more easily may have a role in **training** sonographers and counseling parents whose fetuses have structural defects. Volume imaging has certain limitations and can only be used as a complementary technique.
Record Date Created: 19960321
Record Date Completed: 19960321

```
Set     Items   Description
S1    6019756   S IMAGING OR ACOUSTIC OR ULTRASOUND OR ULTRASONOGR? OR SONOL? OR SONOGR?
OR TOMOGRAPH? OR THERMOGRA? OR ULTRASOUND OR TOMOGRA? OR (MAGNETIC()RESONANCE) OR
(RADIONUCLIDE()SCANNING) OR ULTRASONOGRA? OR CT OR MRI OR (RAPID()PROTOTYPING)
S2        9747   S CRANIOSYNOSTO? OR CRANIOSTOS?
S3      179160   S SUTURE? ? OR (FIBROUS()JOINT? ?) OR SYNOSTOSIS
S4      167953   S SKULL OR(BRAIN()CASE)
S5        2601   S S3(10N)S4
S6        1334   S S1(S)(S2 OR S5)
S7       37900   S DOLL? ? OR BABYDOLL? OR DOLLBAB??? OR FIGURINE? ? OR MANNEQUIN? ? OR
DUMMY OR MANIKIN?
S8           9   S S7 AND S6
S9           3   RD  (unique items)
S10  19625337   S LIKENESS?? OR EFFIG? OR MODEL? ? OR REPRESENTA? OR MOCKUP? ? OR
MOCK()UP? ? OR REPLICA? OR DUMMY OR DUMMIES OR PROTOTYPE? ? OR RESEMBL??? OR SIMULAT??? OR
IMITAT??? OR COPY??? OR COPIE? ? OR MIMIC???? OR FACSIMILE
S11        206   S S6 AND S10
S12         75   S S11/2003:2007
S13        131   S S11 NOT S12
S14         73   RD  (unique items)
S15    4545624   S TOOL OR TRAIN??? OR PRETRAIN??? OR POSTTRAIN??? OR SCREEN???
S16         93   S S6 AND S15
S17         30   S S16/2003:2007
S18         63   S S16 NOT S17
S19         46   S S18 NOT S13
S20         21   RD  (unique items)

?  SHOW FILES
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[File 155] **MEDLINE(R)** 1950-2007/Jan 26
(c) format only 2006 Dialog. All rights reserved.
**File 155: MEDLINE has resumed updating with UD20061209. Please see HELP NEWS 154 for details.*

[File 73] **EMBASE** 1974-2007/Feb 12
(c) 2007 Elsevier B.V. All rights reserved.

[File 5] **Biosis Previews(R)** 1969-2007/Feb W1
(c) 2007 The Thomson Corporation. All rights reserved.
**File 5: In preparation for coming enhancements, accession numbers will change soon. See HELP NEWS 5 for details.*

[File 94] **JICST-EPlus** 1985-2007/Feb W3
(c)2007 Japan Science and Tech Corp(JST). All rights reserved.
**File 94: UD200609W2 is the last update for 2006. UD200701W1 is the first update for 2007. The file is complete and up to date.*

[File 144] **Pascal** 1973-2007/Feb W1
(c) 2007 INIST/CNRS. All rights reserved.

[File 34] **SciSearch(R) Cited Ref Sci** 1990-2007/Feb W1
(c) 2007 The Thomson Corp. All rights reserved.

[File 434] **SciSearch(R) Cited Ref Sci** 1974-1989/Dec
(c) 2006 The Thomson Corp. All rights reserved.

[File 35] **Dissertation Abs Online** 1861-2007/Jan

[File 65] **Inside Conferences** 1993-2007/Feb 09

[File 45] **EMCare** 2007/Feb W1

[File 23] **CSA Technology Research Database** 1963-2007/Jan

[File 2] **INSPEC** 1898-2007/Feb W1

[File 6] **NTIS** 1964-2007/Feb W1

[File 8] **Ei Compendex(R)** 1884-2007/Feb W1

14/7/8 (Item 8 from file: 155) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
MEDLINE(R)

12453844 **PMID:** 10396116

Reduction of operating time and blood transfusion for craniosynostosis by simulated surgery using three-dimensional solid models.

Imai K; Tsujiguchi K; Toda C; Enoki E; Sung K C; Sakamoto H; Kitano S; Hatoko M; Tajima S
Department of Plastic and Reconstructive Surgery, Osaka City General Hospital.
Neurologia medico-chirurgica (JAPAN) Jun 1999 , 39 (6) p423-6; discussion 427 , **ISSN:** 0470-8105--Print
Journal Code: 0400775
Publishing Model Print
Document type: Clinical Trial; Journal Article
Languages: ENGLISH
Main Citation Owner: NLM
Record type: MEDLINE; Completed
Preoperative planning of craniofacial synostosis can be achieved through the use of two- or three-dimensional (3D) computed **tomography** (**CT**) images and by 3D solid **models**. The advantage of using 3D **models** was evaluated by calculating the amount of blood transfused and the operating time for 36 **craniosynostosis** procedures, 21 planned with 3D **models** and 15 with **CT** images performed in the past 7 years. The use of 3D **models** reduced both blood loss and operating time for fronto-orbital advancement with reshaping, LeFort III advancement, and LeFort IV minus Glabellar advancement; blood loss for fronto-orbital advancement without reshaping; and operating time for total cranial reshaping.
Record Date Created: 19990727
Record Date Completed: 19990727

14/7/26 (Item 4 from file: 73) **Links**
Fulltext available through: ScienceDirect (Elsevier) USPTO Full Text Retrieval Options SCIENCEDIRECT
EMBASE

06825732 **EMBASE No:** 1997108230

Preliminary experience with medical applications of rapid prototyping by selective laser sintering

Berry E.; Brown J.M.; Connell M.; Craven C.M.; Efford N.D.; Radjenovic A.; Smith M.A.
Dr. E. Berry, Medical Physics, Wellcome Wing, Leeds General Infirmary, Great George Street, Leeds LS1 3EX United Kingdom
Medical Engineering and Physics (MED. ENG. PHYS.) (United Kingdom) 1997 , 19/1 (90-96)
CODEN: MEPHE **ISSN:** 1350-4533
Publisher Item Identifier: S1350453396000392
Document Type: Journal ; Article
Language: ENGLISH **Summary Language:** ENGLISH
Number Of References: 35

Rapid prototyping techniques, originally developed for building components from computer aided designs in the motor industry, are now being applied in medicine to build **models** of human anatomy from high resolution multiplanar **imaging** data such as computed **tomography** (**CT**). The established technique of stereolithography and the more recent selective laser sintering (SLS), both build up an object by layer. **Models** have applications in surgical planning, for the design of customised implants and for training. Preliminary experience of using the SLS technique for medical applications is described, addressing questions regarding image processing, data transfer and manufacture. Pilot **models**, build from nylon, included two skulls (a child with **craniosynostosis** and an adult with hypertelorism) and a normal femur which was modelled for use in a bioengineering test of an artificial hip. The dimensions of the **models** were found to be in good agreement with the **CT** data from which they were built - for the child's skull the difference between the **model** and the **CT** data was less than 1.0 +/- 0.5 mm in each direction. Our experience showed that, with care, a combination of existing software packages may be used for data conversion. Ideally, image data of high spatial resolution should be used. The pilot **models** generated sufficient clinical interest for the technique to be pursued in the orthopaedic field.

14/7/31 (Item 3 from file: 94) Links
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
JICST-EPlus

02793136 **JICST Accession Number:** 96A0624039 **File Segment:** JICST-E
Accuracy of Life-size, CT-based, Computer-Generated Plastic Skull Replicas. The cause of bone deficits in the orbital floor.
HIRABAYASHI SHIN'ICHI (1); OKUBO EIJI (1) ; HARII KIYONORI (2); SUGAWARA YASUSHI (2); NAKATSUKA TAKASHI (2) ; SAKURAI ATSUSHI (3)
(1) Teikyo Univ. ; (2) Univ. of Tokyo ; (3) Tokyotoritsuotsukabyoin
Nippon Keisei Geka Gakkai Kaishi (Journal of Japan Society of Plastic and Reconstructive Surgery) , 1996 , VOL.16,NO.4 , PAGE.225-233 , FIG.5, TBL.5, REF.11
Journal Number: Z0261BAT **ISSN:** 0389-4703
Universal Decimal Classification: 612.7:007
Language: Japanese **Country of Publication:** Japan
Document Type: Journal
Article Type: Original paper
Media Type: Printed Publication
Abstract: The life-size, **CT**-based, computer-generated skull **replica** has come to play an important role in the field of craniofacial surgery. The skull **replica**, however, has a deficit in that bones of the orbital wall have been partly lost during the manufacturing process. This deficit diminishes the value of skull **replicas** for operations in the orbital regions. There are three major factors supposedly responsible for this "apparent" loss of bone in the orbital wall: the first factor concerns those errors produced during the process of thresholding, the second those during the process of interpolation, and the third those during **model** fabrication utilizing laser lithography. The objective of this study was to elucidate to what extent each factor is responsible for the "false" bone deficits. Materials and Methods: Helical volume **CT** data of the whole head were accumulated with a TCT-900S (Toshiba Co.) with respect to a 5-year-old girl with preoperative unicoronal synostosis. Using this volume data, 0.2mm slice data were prepared and a skull **replica** fabricated with a threshold **CT** value of 200HU. The **skull** was cut at the level of the frontonasal **suture** and a photograph of the orbital floors (A) was taken from above (Fig. 3). 3-D osseous surface images of the orbital floors then were reconstructed with the 0.2mm slice data with threshold **CT** values of 200HU (B) and 100HU (C). Slice data then were prepared with an interval of 2.0mm and images interpolated at 0.2mm on the workstation (Sun SPARC station 2). From these interpolated slice data, 3-D osseous surface images of the orbital floors were reconstructed with threshold **CT** values of 200HU (D) and 100HU (E). The ratios of the area of bone loss to the whole orbital floors in the photograph (A) and 3-D osseous surface images (B,C,D,E) were evaluated with a personal computer (Fig. 4) and then compared with each other. (author abst.)

14/7/38 (Item 1 from file: 34) **Links**
Fulltext available through: USPTO Full Text Retrieval Options SCIENCEDIRECT
SciSearch(R) Cited Ref Sci

11534963 **Genuine Article#:** 608BK **Number of References:** 0
Cranial suture simulator for ultrasound diagnosis of craniosynostosis

Author: Ngo A; Sze RW; Parisi MT; Paladin AM; Cunningham ML
Journal: RADIOLOGY , 2002 , V 225 , S (NOV) , P 141-141
ISSN: 0033-8419 **Publication date:** 20021100
Publisher: RADIOLOGICAL SOC NORTH AMERICA , 820 JORIE BLVD, OAK BROOK, IL 60523 USA
Language: English **Document Type:** MEETING ABSTRACT

14/7/47 (Item 10 from file: 34) **Links**

Fulltext available through: Institute of Electrical and Electronics Engineers USPTO Full Text Retrieval Options SCIENCEDIRECT

SciSearch(R) Cited Ref Sci

05260243 **Genuine Article#:** VL376 **Number of References:** 45

MODEL-BASED DEFORMABLE SURFACE FINDING FOR MEDICAL IMAGES

Author: STAIB LH; DUNCAN JS

Corporate Source: YALE UNIV,DEPT DIAGNOST RADIOL,333 CEDAR ST/NEWHAVEN//CT/06520; YALE UNIV,DEPT ELECT ENGN/NEW HAVEN//CT/06520

Journal: IEEE TRANSACTIONS ON MEDICAL IMAGING , 1996 , V 15 , N5 (OCT) , P 720-731

ISSN: 0278-0062

Language: ENGLISH **Document Type:** ARTICLE

Abstract: This paper describes a new global shape parameterization for smoothly deformable three-dimensional (3-D) objects, such as those found in biomedical images, whose diversity and irregularity make them difficult to represent in terms of fixed features or parts. This **representation** is used for geometric surface matching to 3-D medical image data, such as from magnetic resonance imaging (MRI). The parameterization decomposes the surface into sinusoidal basis functions. Four types of surfaces are modeled: tori, open surfaces, closed surfaces and tubes. This parameterization allows a wide variety of smooth surfaces to be described with a small number of parameters. Extrinsic **model**-based information is incorporated by introducing prior probabilities on the parameters. Surface finding is formulated as an optimization problem, Results of the method applied to synthetic images and 3-D medical images of the heart and brain are presented.

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Set     Items   Description
S1     326561   S IMAGING OR ACOUSTIC OR ULTRASOUND OR ULTRASONOGR? OR SONOL? OR SONOGR?
OR TOMOGRAPH? OR THERMOGRA? OR ULTRASOUND OR TOMOGRA? OR (MAGNETIC()RESONANCE) OR
(RADIONUCLIDE()SCANNING) OR ULTRASONOGRA? OR CT OR MRI OR (RAPID()PROTOTYPING)
S2          17   S CRANIOSYNOSTO? OR CRANIOSTOS?
S3       14039   S SUTURE? ? OR (FIBROUS()JOINT? ?) OR SYNOSTOSIS
S4        2982   S CRANIAL? OR CRANIUM? OR SKULL (BRAIN()CASE) OR FONTANELL?
S5          31   S S3(10N)S4
S6           2   S S1(S)(S2 OR S5)
S7          29   S S5 NOT S6
S8       49633   S DOLL? ? OR BABYDOLL? OR DOLLBAB??? OR FIGURINE? ? OR MANNEQUIN? ? OR
DUMMY OR MANIKIN?
S9     1004152   S LIKENESS?? OR EFFIG? OR MODEL? ? OR REPRESENTA? OR MOCKUP? ? OR
MOCK()UP? ? OR REPLICA? OR DUMMY OR DUMMIES OR PROTOTYPE? ? OR RESEMBL??? OR SIMULAT??? OR
IMITAT??? OR COPY??? OR COPIE? ? OR MIMIC???? OR FACSIMILE
S10    1093540   S TOOL OR TRAIN??? OR PRETRAIN??? OR POSTTRAIN??? OR SCREEN???
S11      23530   S S8:S9(10N)S10
S12         16   S S2 NOT S5
S13        278   S S11(10N)S1
S14        221   S S11(5N)S1
S15     931986   S S4 OR HEAD? ?
S16          3   S S14(10N)S15
S17          2   S S16 NOT (S2 OR S5 OR S6 OR S12)
S18        271   S S11(10N)(S4 OR S15)
S19        200   S S11(5N)(S4 OR S15)
S20      16941   S S8:S9(5N)S10
S21        120   S S20(5N)(S4 OR S15)
S22        119   S S21 NOT (S2 OR S5 OR S6 OR S12 OR S16)
S23        119   IDPAT (sorted in duplicate/non-duplicate order)
S24        114   IDPAT (primary/non-duplicate records only)

? show files
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[File 347] **JAPIO** Dec 1976-2006/Oct(Updated 070201)

[File 350] **Derwent WPIX** 1963-2006/UD=200709

File 350: DWPI has been enhanced to extend content and functionality of the database. For more info, visit http://www.dialog.com/dwpi/.

6/5/2 (Item 2 from file: 350) **Links**
Derwent WPIX

0014451128 *Drawing available*
WPI Acc no: 2004-642118/
XRPX Acc No: N2004-507814
Medical simulator for use as screening tool to detect craniosynotosis, has life size model with simulated patent skull sutures, where echogenicity of each suture enables suture to be readily distinguishable in image of model

Patent Assignee: UNIV WASHINGTON (UNIW)
Inventor: NGO A; SZE R W

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20040175685	A1	20040909	US 2002431279	P	20021205	200462	B
			US 2003729364	A	20031205		

Priority Applications (no., kind, date): US 2002431279 P 20021205; US 2003729364 A 20031205

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
US 20040175685	A1	EN	17	7	Related to Provisional	US 2002431279

Alerting Abstract US A1
NOVELTY - The simulator has a life size model (10) of a human head, where the model includes simulated patent skull sutures (12). An echogenicity of each simulated patent skull suture enables the simulated patent skull suture to be readily distinguishable in an ultrasound image of the model. The model is fabricated from a material and the patent skull suture has an opening formed in the material.
DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of making an ultrasound trainer configured to train ultrasound operators to perform craniosynotosis screenings using ultrasound.
USE - Used for simulating an anatomical position of a skull suture in infant or young children to train a radiologist and an ultrasound technician in anatomy of pediatric **cranial suture** and also as a screening tool to detect craniosynotosis.
ADVANTAGE - The life size model with simulated patent skull suture enables the simulated patent skull suture to be readily distinguishable in an **ultrasound** image of the model, thereby enabling trainees to acquire familiarity with the **ultrasound** scanning techniques and the required understanding of skull anatomy. The model also enables the trainees to become familiar with the range of normal and abnormal findings they encounter with real patients.
DESCRIPTION OF DRAWINGS - The drawing schematically illustrates a doll's head in which openings corresponding to skull sutures have been made, producing a simulator for use in training **ultrasound** technicians in craniosynotosis screening.
10 Life size model
12 Simulated patent skull sutures

Title Terms /Index Terms/Additional Words: MEDICAL; SIMULATE; SCREEN; TOOL; DETECT; LIFE; SIZE;

MODEL; PATENT; SKULL; SUTURE; ENABLE; READY; DISTINGUISH; IMAGE

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
G09B-023/28			Main		"Version 7"

US Classification, Issued: 434270000

File Segment: EngPI; EPI;
DWPI Class: S05; P85
Manual Codes (EPI/S-X): S05-P

5/5/5 (Item 5 from file: 350) **Links**
Derwent WPIX

0014451128 *Drawing available*
WPI Acc no: 2004-642118/
XRPX Acc No: N2004-507814
Medical simulator for use as screening tool to detect craniosynotosis, has life size model with simulated patent skull sutures, where echogenicity of each suture enables suture to be readily distinguishable in image of model

Patent Assignee: UNIV WASHINGTON (UNIW)
Inventor: NGO A; SZE R W

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20040175685	A1	20040909	US 2002431279	P	20021205	200462	B
			US 2003729364	A	20031205		

Priority Applications (no., kind, date): US 2002431279 P 20021205; US 2003729364 A 20031205

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
US 20040175685	A1	EN	17	7	Related to Provisional	US 2002431279

Alerting Abstract US A1
NOVELTY - The simulator has a life size model (10) of a human head, where the model includes simulated patent skull sutures (12). An echogenicity of each simulated patent skull suture enables the simulated patent skull suture to be readily distinguishable in an ultrasound image of the model. The model is fabricated from a material and the patent skull suture has an opening formed in the material.
DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of making an ultrasound trainer configured to train ultrasound operators to perform craniosynotosis screenings using ultrasound.
USE - Used for simulating an anatomical position of a skull suture in infant or young children to train a radiologist and an ultrasound technician in anatomy of pediatric **cranial suture** and also as a screening tool to detect craniosynotosis.
ADVANTAGE - The life size model with simulated patent skull suture enables the simulated patent skull suture to be readily distinguishable in an ultrasound image of the model, thereby enabling trainees to acquire familiarity with the ultrasound scanning techniques and the required understanding of skull anatomy. The model also enables the trainees to become familiar with the range of normal and abnormal findings they encounter with real patients.
DESCRIPTION OF DRAWINGS - The drawing schematically illustrates a doll's head in which openings corresponding to skull sutures have been made, producing a simulator for use in training ultrasound technicians in craniosynotosis screening.
10 Life size model
12 Simulated patent skull sutures

Title Terms /Index Terms/Additional Words: MEDICAL; SIMULATE; SCREEN; TOOL; DETECT; LIFE; SIZE;

MODEL; PATENT; SKULL; SUTURE; ENABLE; READY; DISTINGUISH; IMAGE

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
G09B-023/28			Main		"Version 7"

US Classification, Issued: 434270000

File Segment: EngPI; EPI;
DWPI Class: S05; P85
Manual Codes (EPI/S-X): S05-P

5/5/6 (Item 6 from file: 350) **Links**
Derwent WPIX

0014367695 *Drawing available*
WPI Acc no: 2004-556463/
XRAM Acc no: C2004-203680
XRPX Acc No: N2004-440390
Artificial bone/cartilage manufacturing method e.g. for mouth bone, involves forming liquid and powder mixture in layers repeatedly, on solid surface to form three-dimensional (3D) bone/cartilage structure
Patent Assignee: NEXT KK (NEXT-N); SHINTO BURETA KK (SHIN-N)
Inventor: NISHIMURA K; SUZUKI S

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
JP 2004202126	A	20040722	JP 2002377836	A	20021226	200454	B

Priority Applications (no., kind, date): JP 2002377836 A 20021226

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes
JP 2004202126	A	JA	12	2	

Alerting Abstract JP A
NOVELTY - The powder and liquid materials are mixed and injected on solid surface through nozzle (1). A layer made of powder and liquid mixture is formed on solid surface by adhering liquid material on the surface. The mixture is formed in layers repeatedly, on solid surface to form three-dimensional (3D) bone/cartilage structure. The mix ratio of powder and liquid material is changed based on patient's bone/cartridge image.
USE - For manufacturing artificial bone/cartilage of mouth, and lips affected by microtia, **cranial sutures**, uranoschisis, malignant osteoncus, using injection molding technique.
ADVANTAGE - Provides excellent transplantable bio-compatible bone/cartilage for human by easily changing mix ratio of powder and liquid materials based on the bone/cartilage image of patient.
DESCRIPTION OF DRAWINGS - The figure shows the schematic diagram of the artificial bone/cartilage manufacturing apparatus.
1 nozzle
2 powder gas fluidization tank
3 liquid material container
4 powder flow path
5 liquid flow path

Title Terms /Index Terms/Additional Words: ARTIFICIAL; BONE; CARTILAGE; MANUFACTURE; METHOD; MOUTH; FORMING; LIQUID; POWDER; MIXTURE; LAYER; REPEAT; SOLID; SURFACE; FORM; THREE; DIMENSION; STRUCTURE

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
A61F-002/28			Main		"Version 7"
A61L-027/00; B28B-001/32; B29C-067/00			Secondary		"Version 7"

File Segment: CPI; EngPI
DWPI Class: A32; A96; B07; D22; P32; P64
Manual Codes (CPI/A-N): A03-A01; A11-B12A; A12-V02; B04-C02; B04-D01; B04-N02; B04-N06; B05-A01B; B05-B02A3; B11-C04A; D09-C01D

24/5/23 (Item 23 from file: 350) **Links**
Derwent WPIX

0013778484 *Drawing available*
WPI Acc no: 2003-877909/200382
Medical training doll head articulator controller has rails on a perforated base carrying the mobile articulator with fasteners
Patent Assignee: FERNANDES P (FERN-I)
Inventor: FERNANDES P

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
BR 200200674	A	20031028	BR 2002674	A	20020221	200382	B

Priority Applications (no., kind, date): BR 2002674 A 20020221

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes
BR 200200674	A	PT	1	1	

Title Terms /Index Terms/Additional Words: MEDICAL; TRAINING; DOLL; HEAD; ARTICULATE; CONTROL; RAIL; PERFORATION; BASE; CARRY; MOBILE; FASTEN

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
A61C-011/00			Main		"Version 7"

File Segment: EngPI; ;
DWPI Class: P32

24/5/46 (Item 46 from file: 350) **Links**
Derwent WPIX

0009324014 *Drawing available*
WPI Acc no: 1999-255677/
XRPX Acc No: N1999-190397
Biomechanical head model to demonstrate load distribution on head and throat muscle groups
Patent Assignee: STELZENMUELLER W (STEL-I)
Inventor: STELZENMUELLER W

Patent Family (2 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
DE 19742834	A1	19990401	DE 19742834	A	19970928	199922	B
DE 19742834	B4	20040129	DE 19742834	A	19970928	200408	E

Priority Applications (no., kind, date): DE 19742834 A 19970928

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes
DE 19742834	A1	DE	5	2	

Alerting Abstract DE A1
NOVELTY - The model comprises an artificial skull (1) with articulately arranged lower jaw bones (2) and a rod or tubular support (3) simulating the upper end of the spinal column which is bendable and stabilisable in each arbitrary curvature position. The support at its lower end is held in a base (5) and at its upper end the artificial skull is held.
DESCRIPTION - The base by means of ball joints (8,9) is held with angle graduation (10) in an upright (11) and on the support, the base and lower jaw bones (2) retainers (12) are provided for fitting elastic draw springs (14) with integrated spring balances (15). These springs **simulate** the human muscle **train** holding and moving the **head** and lower jaw bones.
USE - To place in evidence the reactive effects of biomechanical alterations in the head and throat area on the masticatory musculature.
ADVANTAGE - The model enables the distribution of loads on the various muscle groups to be demonstrated.
DESCRIPTION OF DRAWINGS - The figure presents schematically a biomechanical model.
1 artificial skull
2 lower jaw bones
3 support
5 base
8,9 ball joints
10 angle graduation
11 upright
12 retainers

14 draw springs
15 spring balances

Title Terms /Index Terms/Additional Words: HEAD; MODEL; DEMONSTRATE; LOAD; DISTRIBUTE; THROAT; MUSCLE; GROUP

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
G09B-023/30			Main		"Version 7"

File Segment: EngPI; ;
DWPI Class: P85

24/5/69 (Item 69 from file: 350) **Links**
Derwent WPIX

0005239035 *Drawing available*
WPI Acc no: 1990-232154/
XRAM Acc no: C1990-100249
XRPX Acc No: N1990-180025
EEG teaching head model - has polyester head with iron filings fitted with black and white circular magnets
Patent Assignee: KOLLIKOWSKI H (KOLL-I)
Inventor: KOLLIKOWSK H

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
DE 3900006	C	19900802	DE 3900006	A	19890102	199031	B

Priority Applications (no., kind, date): DE 3900006 A 19890102
Alerting Abstract DE C
EEG teaching **head model trains** in electrode placing for an EEG hood in accordance with the international 10-20 system. The head should consist of totally magnetic plastics and should be fitted with a set of black and white marked circular magnets. Pref. head material is polyester with embedded fine iron filings in a ratio of 6:1. USE/ADVANTAGE - Model is used for training, EEG electrode positioning. Easily transported polyester head with iron filings presents a nonscratching surface for marking out with indicating magnets.

Title Terms /Index Terms/Additional Words: EEG; TEACH; HEAD; MODEL; POLYESTER; IRON; FILE; FIT; BLACK; WHITE; CIRCULAR; MAGNET

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
G09B-023/28			Secondary		"Version 7"

File Segment: CPI; EngPI
DWPI Class: A96; P85
Manual Codes (CPI/A-N): A05-E01D2; A08-M09A; A08-R05; A09-A04; A12-E08; A12-F

```
Set     Items   Description
S1     326561   S IMAGING OR ACOUSTIC OR ULTRASOUND OR ULTRASONOGR? OR SONOL? OR SONOGR?
OR TOMOGRAPH? OR THERMOGRA? OR ULTRASOUND OR TOMOGRA? OR (MAGNETIC()RESONANCE) OR
(RADIONUCLIDE()SCANNING) OR ULTRASONOGRA? OR CT OR MRI OR (RAPID()PROTOTYPING)
S2         17   S CRANIOSYNOSTO? OR CRANIOSTOS?
S3      14039   S SUTURE? ? OR (FIBROUS()JOINT? ?) OR SYNOSTOSIS
S4       2748   S SKULL OR (BRAIN()CASE)
S5         13   S S3(10N)S4
S6          1   S S1(S)(S2 OR S5)
S7         12   S S5 NOT S6
S8    1093540   S TOOL OR TRAIN??? OR PRETRAIN??? OR POSTTRAIN??? OR SCREEN???
S9      49633   S DOLL? ? OR BABYDOLL? OR DOLLBAB??? OR FIGURINE? ? OR MANNEQUIN? ? OR
DUMMY OR MANIKIN?
S10   1004152   S LIKENESS?? OR EFFIG? OR MODEL? ? OR REPRESENTA? OR MOCKUP? ? OR
MOCK()UP? ? OR REPLICA? OR DUMMY OR DUMMIES OR PROTOTYPE? ? OR RESEMBL??? OR SIMULAT??? OR
IMITAT??? OR COPY??? OR COPIE? ? OR MIMIC???? OR FACSIMILE
S11   1093540   S TOOL OR TRAIN??? OR PRETRAIN??? OR POSTTRAIN??? OR SCREEN???
S12     61896   S S8:S9(10N)S10
S13        17   S S2 NOT S5
S14      6232   S S11(10N)S1
S15      4194   S S11(5N)S1
S16    931561   S S4 OR HEAD? ?
S17        48   S S15(10N)S16
S18        47   S S17 NOT (S2 OR S5 OR S13)
; show files
```

6/5/1 (Item 1 from file: 350) **Links**
Derwent WPIX

0014451128 *Drawing available*
WPI Acc no: 2004-642118/
XRPX Acc No: N2004-507814
Medical simulator for use as screening tool to detect craniosynotosis, has life size model with simulated patent skull sutures, where echogenicity of each suture enables suture to be readily distinguishable in image of model

Patent Assignee: UNIV WASHINGTON (UNIW)
Inventor: NGO A; SZE R W

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20040175685	A1	20040909	US 2002431279	P	20021205	200462	B
			US 2003729364	A	20031205		

Priority Applications (no., kind, date): US 2002431279 P 20021205; US 2003729364 A 20031205

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
US 20040175685	A1	EN	17	7	Related to Provisional	US 2002431279

Alerting Abstract US A1
NOVELTY - The simulator has a life size model (10) of a human head, where the model includes simulated patent skull sutures (12). An echogenicity of each simulated patent skull suture enables the simulated patent skull suture to be readily distinguishable in an **ultrasound** image of the model. The model is fabricated from a material and the patent **skull suture** has an opening formed in the material.
DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of making an ultrasound trainer configured to train ultrasound operators to perform craniosynotosis screenings using ultrasound.
USE - Used for simulating an anatomical position of a **skull suture** in infant or young children to train a radiologist and an **ultrasound** technician in anatomy of pediatric cranial suture and also as a screening tool to detect craniosynotosis.
ADVANTAGE - The life size model with simulated patent **skull suture** enables the simulated patent **skull suture** to be readily distinguishable in an **ultrasound** image of the model, thereby enabling trainees to acquire familiarity with the **ultrasound** scanning techniques and the required understanding of skull anatomy. The model also enables the trainees to become familiar with the range of normal and abnormal findings they encounter with real patients.
DESCRIPTION OF DRAWINGS - The drawing schematically illustrates a doll's head in which openings corresponding to **skull sutures** have been made, producing a simulator for use in training **ultrasound** technicians in craniosynotosis screening.
10 Life size model
12 Simulated patent **skull sutures**

Title Terms /Index Terms/Additional Words: MEDICAL; SIMULATE; SCREEN; TOOL; DETECT; LIFE; SIZE;

MODEL; PATENT; SKULL; SUTURE; ENABLE; READY; DISTINGUISH; IMAGE

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
G09B-023/28			Main		"Version 7"

US Classification, Issued: 434270000

File Segment: EngPI; EPI;
DWPI Class: S05; P85
Manual Codes (EPI/S-X): S05-P

5/5/3 (Item 2 from file: 350) **Links**
Derwent WPIX

0014451128 *Drawing available*
WPI Acc no: 2004-642118/
XRPX Acc No: N2004-507814
Medical simulator for use as screening tool to detect craniosynotosis, has life size model with simulated patent skull sutures, where echogenicity of each suture enables suture to be readily distinguishable in image of model

Patent Assignee: UNIV WASHINGTON (UNIW)
Inventor: NGO A; SZE R W

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update	Type
US 20040175685	A1	20040909	US 2002431279	P	20021205	200462	B
			US 2003729364	A	20031205		

Priority Applications (no., kind, date): US 2002431279 P 20021205; US 2003729364 A 20031205

Patent Details

Patent Number	Kind	Lan	Pgs	Draw	Filing Notes	
US 20040175685	A1	EN	17	7	Related to Provisional	US 2002431279

Alerting Abstract US A1
NOVELTY - The simulator has a life size model (10) of a human head, where the model includes simulated patent **skull sutures** (12). An echogenicity of each simulated patent **skull suture** enables the simulated patent **skull suture** to be readily distinguishable in an ultrasound image of the model. The model is fabricated from a material and the patent **skull suture** has an opening formed in the material.
DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of making an ultrasound trainer configured to train ultrasound operators to perform craniosynotosis screenings using ultrasound.
USE - Used for simulating an anatomical position of a **skull suture** in infant or young children to train a radiologist and an ultrasound technician in anatomy of pediatric cranial suture and also as a screening tool to detect craniosynotosis.
ADVANTAGE - The life size model with simulated patent **skull suture** enables the simulated patent **skull suture** to be readily distinguishable in an ultrasound image of the model, thereby enabling trainees to acquire familiarity with the ultrasound scanning techniques and the required understanding of skull anatomy. The model also enables the trainees to become familiar with the range of normal and abnormal findings they encounter with real patients.
DESCRIPTION OF DRAWINGS - The drawing schematically illustrates a doll's head in which openings corresponding to **skull sutures** have been made, producing a simulator for use in training ultrasound technicians in craniosynotosis screening.
10 Life size model
12 Simulated patent **skull sutures**

Title Terms /Index Terms/Additional Words: MEDICAL; SIMULATE; SCREEN; TOOL; DETECT; LIFE; SIZE;

MODEL; PATENT; SKULL; SUTURE; ENABLE; READY; DISTINGUISH; IMAGE

Class Codes

International Patent Classification

IPC	Class Level	Scope	Position	Status	Version Date
G09B-023/28			Main		"Version 7"

US Classification, Issued: 434270000

File Segment: EngPI; EPI;
DWPI Class: S05; P85
Manual Codes (EPI/S-X): S05-P

Set Items Description
S1 1129072 S IMAGING OR ACOUSTIC OR ULTRASOUND OR ULTRASONOGR? OR SONOL? OR SONOGR? OR TOMOGRAPH? OR THERMOGRA? OR ULTRASOUND OR TOMOGRA? OR (MAGNETIC()RESONANCE) OR (RADIONUCLIDE()SCANNING) OR ULTRASONOGRA? OR CT OR MRI OR (RAPID()PROTOTYPING)
S2 197 S CRANIOSYNOSTO? OR CRANIOSTOS?
S3 18455 S SUTURE? ? OR (FIBROUS()JOINT? ?) OR SYNOSTOSIS
S4 12604 S CRANIAL? OR CRANIUM? OR SKULL (BRAIN()CASE) OR FONTANELL?
S5 148 S S3(10N)S4
S6 34 S S1(S)(S2 OR S5)
S7 18 S S6/2003:2007
S8 16 S S6 NOT S7
S9 14 RD (unique items)
S10 137787 S DOLL? ? OR BABYDOLL? OR DOLLBAB??? OR FIGURINE? ? OR MANNEQUIN? ? OR DUMMY OR MANIKIN?
S11 7815471 S LIKENESS?? OR EFFIG? OR MODEL? ? OR REPRESENTA? OR MOCKUP? ? OR MOCK()UP? ? OR REPLICA? OR DUMMY OR DUMMIES OR PROTOTYPE? ? OR RESEMBL??? OR SIMULAT??? OR IMITAT??? OR COPY??? OR COPIE? ? OR MIMIC???? OR FACSIMILE
S12 90443 S (S1:S2 OR S5)(S)(S10:S11)
S13 40579 S (S1:S2 OR S5)(10N)(S10:S11)
S14 35837 S S10(10N)S11
S15 170 S (S1:S2 OR S5)(S)S14
S16 59 S S15/2003:2007
S17 111 S S15 NOT S16
S18 111 S S17 NOT S8

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[File 275] **Gale Group Computer DB(TM)** 1983-2007/Feb 08
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[File 674] **Computer News Fulltext** 1989-2006/Sep W1
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[File 15] **ABI/Inform(R)** 1971-2007/Feb 09

9/3,K/1 (Item 1 from file: 47) **Links**
Gale Group Magazine DB(TM)

06073591 **Supplier Number:** 74521704 (USE FORMAT 7 OR 9 FOR FULL TEXT)
3-D Ultrasound Helps Identify Abnormalities in Fetal Brain, Spine, Abdomen.

GLASS, JUDY
OB GYN News , 36 , 7 , 13
April 1 , 2001
ISSN: 0029-7437
Language: English **Record Type:** Fulltext
Word Count: 800 **Line Count:** 00069

...that is not as easily obtainable with 2-D ultrasound.

* Fetal brain and cranial structure **imaging**. Viewing the fetus through the fontanelle using the 3-D endovaginal probe provides an optimal window for **imaging** fetal brain anatomy, including enlarged ventricles and posterior fossa abnormalities not available with standard **ultrasound**. The 3-D images of the skull are superior to the conventional 2-D view that is often limited to the **cranial sutures** due to the natural curvature of the skull.

* Evaluation of the spine. The ability to...

18/3,K/3 (Item 3 from file: 47) **Links**
Gale Group Magazine DB(TM)

06039677 **Supplier Number:** 72295648 (USE FORMAT 7 OR 9 FOR FULL TEXT)
Helping Doctors Feel Better.(Technology Information)

AMATO, IVAN
Technology Review (Cambridge, Mass.) , 104 , 3 , 65
April , 2001
ISSN: 1099-274X
Language: English **Record Type:** Fulltext; Abstract
Word Count: 3517 **Line Count:** 00282

...At Beth Israel Deaconess, residents must demonstrate proficiency with a MedSim device--a non-haptic **dummy** torso used for **ultrasound** training--before performing a real intravaginal **ultrasound**. But with haptics so new, no student is yet required to master any haptics-enhanced ...

18/3,K/104 (Item 9 from file: 16) **Links**
Gale Group PROMT(R)

06913038 **Supplier Number:** 58458508 **(USE FORMAT 7 FOR FULLTEXT)**

Bigger, Better Ultrasound Volumes.(Technology Information)
Mahoney, Diana Phillips
Computer Graphics World , v 22 , n 12 , p 18
Dec , 1999
Language: English **Record Type:** Fulltext Abstract
Document Type: Magazine/Journal ; Trade
Word Count: 1210

...is intended. For example, MedSim has patented the technology for use in a real-time **ultrasound**-based visual simulator that it has developed for medical training. With the system, students learn how to identify and diagnose a range of medical conditions by operating a **simulated ultrasound** device on a **mannequin**. For this application, says Cohen-Or, "the mosaics let us build a database large enough...

18/3,K/105 (Item 10 from file: 16) **Links**
Gale Group PROMT(R)

04569084 **Supplier Number:** 46716341

New device makes medical scans easy.
Miami Herald (FL) , p Bus17
Sept 16 , 1996
Language: English **Record Type:** Abstract
Document Type: Newspaper ; Trade

Abstract:

MedSim (Kfar-Sava, Israel), a manufacturer of medical simulation devices, has developed an **ultrasound** training simulation that is designed to improve while hastening the training of would-be **ultrasound** specialists. The **simulator** consists primarily of a **mannequin**, which is implanted with a transmitter that creates an electromagentic field; a receiver-transducer, which...

...internal body on a color monitor. The simulator will be a helpful teaching tool for **ultrasound** trainees who get little time to examine real hospital patients. With the simulator, students are...

Set Items Description
S1 1130063 S IMAGING OR ACOUSTIC OR ULTRASOUND OR ULTRASONOGR? OR SONOL? OR SONOGR? OR TOMOGRAPH? OR THERMOGRA? OR ULTRASOUND OR TOMOGRA? OR (MAGNETIC()RESONANCE) OR (RADIONUCLIDE()SCANNING) OR ULTRASONOGRA? OR CT OR MRI OR (RAPID()PROTOTYPING)
S2 198 S CRANIOSYNOSTO? OR CRANIOSTOS?
S3 18496 S SUTURE? ? OR (FIBROUS()JOINT? ?) OR SYNOSTOSIS
S4 22902 S SKULL OR (BRAIN()CASE)
S5 119 S S3(10N)S4
S6 31 S S1(S)(S2 OR S5)
S7 16 S S6/2003:2007
S8 15 S S6 NOT S7
S9 13 RD (unique items)
S10 137983 S DOLL? ? OR BABYDOLL? OR DOLLBAB??? OR FIGURINE? ? OR MANNEQUIN? ? OR DUMMY OR MANIKIN?
S11 7834897 S LIKENESS?? OR EFFIG? OR MODEL? ? OR REPRESENTA? OR MOCKUP? ? OR MOCK()UP? ? OR REPLICA? OR DUMMY OR DUMMIES OR PROTOTYPE? ? OR RESEMBL??? OR SIMULAT??? OR IMITAT??? OR COPY??? OR COPIE? ? OR MIMIC???? OR FACSIMILE
S12 90517 S (S1:S2 OR S5)(S)(S10:S11)
S13 40620 S (S1:S2 OR S5)(10N)(S10:S11)
S14 35870 S S10(10N)S11
S15 170 S (S1:S2 OR S5)(S)S14
S16 59 S S15/2003:2007
S17 111 S S15 NOT S16
S18 111 S S17 NOT S8

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[File 47] **Gale Group Magazine DB(TM)** 1959-2007/Feb 02

[File 275] **Gale Group Computer DB(TM)** 1983-2007/Feb 09

[File 647] **CMP Computer Fulltext** 1988-2007/Apr W4

[File 674] **Computer News Fulltext** 1989-2006/Sep W1

**File 674: File 674 is closed (no longer updates).*

[File 148] **Gale Group Trade & Industry DB** 1976-2007/Feb 02

[File 621] **Gale Group New Prod.Annou.(R)** 1985-2007/Feb 02

[File 441] **ESPICOM Pharm&Med DEVICE NEWS** 2007/Aug W1

[File 149] **TGG Health&Wellness DB(SM)** 1976-2007/Jan W4

[File 15] **ABI/Inform(R)** 1971-2007/Feb 10

[File 635] **Business Dateline(R)** 1985-2007/Feb 10

[File 636] **Gale Group Newsletter DB(TM)** 1987-2007/Feb 09

[File 135] **NewsRx Weekly Reports** 1995-2007/Feb W1

[File 989] **NewsRoom Alert** Feb 12

[File 16] **Gale Group PROMT(R)** 1990-2007/Feb 09

[File 160] **Gale Group PROMT(R)** 1972-1989

18/3,K/105 (Item 10 from file: 16) **Links**
Gale Group PROMT(R)

04569084 **Supplier Number:** 46716341

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Miami Herald (FL) , p Bus17
Sept 16 , 1996
Language: English **Record Type:** Abstract
Document Type: Newspaper ; Trade

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